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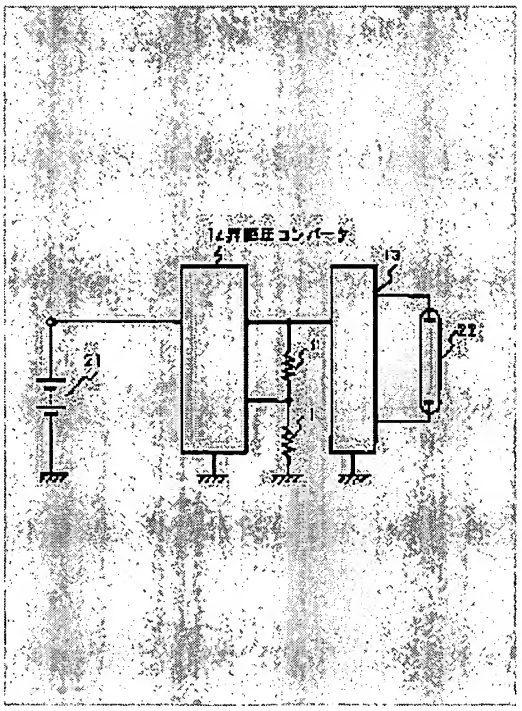
(54) LIGHTING CIRCUIT FOR FLUORESCENT LAMP

(57)Abstract:

PURPOSE: To improve efficiency in a battery-using voltage region by controlling the set control output voltage of a liquid crystal backlight inverter to a predetermined value via a converter which works to raise and lower voltage.

CONSTITUTION: A lamp 22 is driven via a DC power source 21, a voltage raising/lowering DC-DC converter 14, and an inverter 13. When an output voltage is set to roughly halfway between the upper and lower limits of the operating input voltage fluctuation range of a battery 21, then the difference between input and output voltages is reduced, and voltage conversion efficiency in a batter-using voltage region is optimized. This efficiency enhancement leads to reduction in the power consumed by the system.



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[Date of final disposal for application]

[Patent number]

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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the drive circuit of a fluorescent lamp which mainly serves as the back light light source of a liquid crystal display.
[0002]
[Description of the Prior Art] It is usually that the conventional lighting circuit for fluorescent lamps sets the output voltage of a pressure-lowering DC-DC converter below to the MIN value of the input voltage change range, and uses it for JP,3-11595,A like a publication.
[0003]
[Problem(s) to be Solved by the Invention] In the narrow field of the input voltage change range, although it is effective, input voltage differs from the input voltage at the time of cell use greatly at the time of adapter use, and the conventional technology becomes disadvantageous [the change range at the time of cell use] for a latus case. That is, with a pressure-lowering converter, it is the control-output voltage Vo. It is surely Vo<Vba (min). -- It becomes below minimum voltage at the time of cell use, and no matter what voltage may be inputted, you have to lower the pressure below to Vba (min). Moreover, conversely, by the pressure-up converter, if it becomes control-output voltage Vo<Vin, it becomes impossible to stabilize output voltage and output voltage will go up with Vo=Vin. Therefore, Vo>Vad (max) -- It had to set up more than upper limit voltage at the time of adapter use, and in order to transform the low voltage at the time of cell use into high voltage, the consideration of as opposed to system efficiency in this way by which decline in efficiency was not avoided was not made.
[0004] The purpose of this invention is to offer the efficient lighting circuit for fluorescent lamps at the time of cell use, without causing degradation by wide-range voltage correspondence.
[0005]
[Means for Solving the Problem] Since the above-mentioned purpose is attained, this invention sets the output voltage of the pressure-lowering DC-DC converter usually used below to an input voltage MIN value. or completely apart from the method of setting up the output voltage of a pressure-up DC-DC converter beyond an input voltage MAX value The lighting circuit which can perform operation which combines both a pressure up and pressure lowering is used, and it is the control-output voltage Vo. Especially at the time of adapter use, input voltage upper limit Vad (max), It is [as opposed to / the input voltage upper limit Vba (max) and the input voltage lower limit Vba (min) / the time of cell use] / (Vba(max)+Vba (min)) 2x0.8<=Vo<= (Vba(max)+Vba (min)) / 2x1.2. It sets up.
[0006]
[Function] The converter equipped with the step-down-and-step-up function is the setting control-output voltage Vo. In the high input voltage change range, it operates as a pressure-lowering DC-DC converter, and operation is automatically changed as a pressure-up DC-DC converter in the low input voltage change range from the setting control-output voltage Vo. Since power conversion efficiency falls so that input voltage and a setting output voltage difference become large, it becomes possible by setting up an I/O voltage difference small to raise system efficiency. Therefore, system efficiency is improvable if

efficiency sets up setting control-output voltage in the center of a simultaneously of the bound value of the cell input voltage change range thought most as important.
[0007]
[Example] Hereafter, drawing 1 or drawing 5 explains one example of this invention. Drawing 1 shows the block diagram of the conventional inverter circuit. A power supply 21 usually consists of two power supplies of an adapter and a cell, and the pressure of it is lowered on the fixed voltage below the supply voltage which absorbs the voltage variation of a power supply 21 by the pressure-lowering converter 11, and is set up by the feedback voltage setting resistance 1. This output voltage is impressed to the main inverter 13, DC-AC conversion is performed, and a lamp 22 is turned on.
[0008] With this method, i.e., a pressure-lowering converter, it is the control-output voltage Vo. It is surely Vo<. Vba (min) -- It becomes below minimum voltage at the time of cell use, and no matter what voltage may be inputted, you have to lower the pressure below on the minimum voltage Vba (min) at the time of cell use.
[0009] Input voltage follows on going up from the minimum voltage Vba (min) to the upper limit voltage Vad (max) at the time of adapter use at the time of cell use, and system efficiency continues descending. The maximum efficiency point in this method exists in the minimum voltage (Vba (min)) of supply voltage.
[0010] Drawing 2 shows one example of this invention. A power supply 21 usually consists of two power supplies of an adapter and a cell, consists of two kinds of converters which have each function of the pressure-lowering converter 11 and the pressure-up converter 12, operates the pressure-up converter 12 with feedback voltage at the time of (Vba(max)+Vba (min)) / 2<Vo, and operates the pressure-lowering converter 11 at Vo< (Vba(max)+Vba (min)) / 2:00. This output voltage is impressed to the main inverter 13, DC-AC conversion is performed, and a lamp 22 is turned on.
[0011] Drawing 3 shows one example of this invention. A power supply 21 usually consists of two power supplies of an adapter and a cell, and consists of a step-down-and-step-up converter 14. This newly adds a transistor and diode to the pressure-lowering converter 11, is constituted, operates as a pressure-up converter at the time of /2<Vo (Vba(max)+Vba (min)), and operates as a pressure-lowering converter at Vo< (Vba(max)+Vba (min)) / 2:00.
[0012] Change motion control is possible also by the current-feedback resistance 2 indicated to be the case where it is based on the feedback voltage setting resistance 1 to drawing 4 .
[0013] The efficiency property effect of this invention is shown in drawing 5 . According to this invention, from drawing 5 , the maximum efficiency is demonstrated in the simultaneously center point of a cell use field. in (Vba(max)+Vba (min)) / 2x0.8>Vo field A predominance over a circuit efficiency fades conventionally. conversely (Vba(max)+Vba (min)) in a /2x1.2<Vo field /2x0.8<=Vo<= since the degradation at the time of the minimum voltage Vba (min) is expected at the time of cell use (Vba(max) +Vba (min)) (improvement in efficiency is achieved under Vba(max)+Vba (min) / 2x1.2 conditions.)
[0014]
[Effect of the Invention] According to this invention, optimum efficiency is obtained in the cell use field to which efficiency is thought most as important, and an effect is in power consumption reduction of a system.

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] The lighting circuit for fluorescent lamps characterized by setting control-output voltage as input voltage change within the limits in the lighting circuit which consists of an inverter which drives a fluorescent lamp by the RF, and a DC-DC converter which makes the light of the input voltage control and modulate.
[Claim 2] The lighting circuit for fluorescent lamps equipped with the step-down-and-step-up function which can perform operation which combines both a pressure up and pressure lowering by the aforementioned DC-DC converter in a claim 1.
[Claim 3] a claim 1 -- setting -- the aforementioned DC-DC converter -- control-output voltage Vo especially -- the input voltage upper limit Vba (max) at the time of cell use, and a lower limit Vba (min) -- receiving -- /(Vba(max)+Vba (min)) 2x0.8<=Vo<= (Vba(max)+Vba (min)) / 2x1.2 ** -- lighting circuit for fluorescent lamps carried out

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the circuit diagram of lighting for fluorescent lamps conventionally explaining one example of this invention.
[Drawing 2] The circuit diagram of lighting for fluorescent lamps explaining one example of this invention.
[Drawing 3] The circuit diagram of lighting for fluorescent lamps explaining one example of this invention.
[Drawing 4] The circuit diagram of lighting for fluorescent lamps explaining one example of this invention.
[Drawing 5] The property view of the efficiency explaining the example of 1 effect of this invention.
[Description of Notations]
1 [-- A pressure-lowering converter 12 / -- A pressure-up converter, 13 / -- A main inverter, 14 / -- A step-down-and-step-up converter, 21 / -- A power supply, 22 / -- Lamp.] -- Resistance, 2 -- Current detection resistance, 11

[Translation done.]

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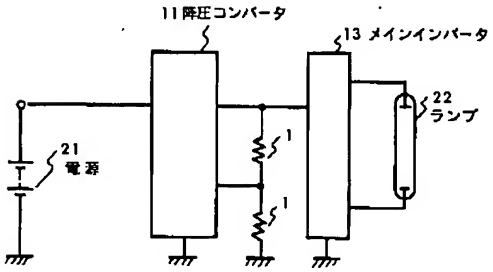
DRAWINGS

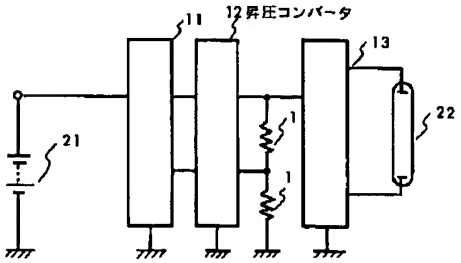
[Drawing 1]

図 1



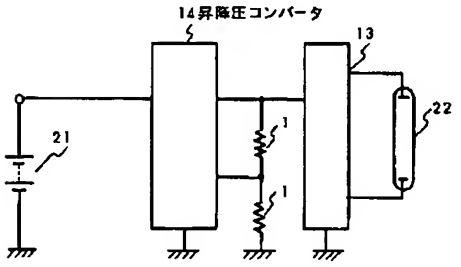
[Drawing 2]

図 2



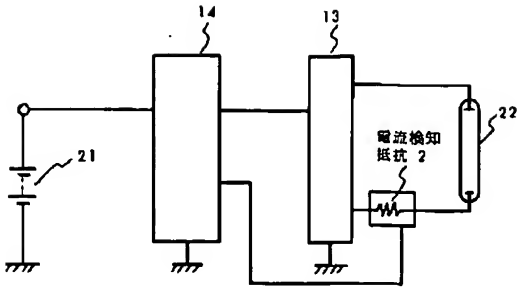
[Drawing 3]

図 3



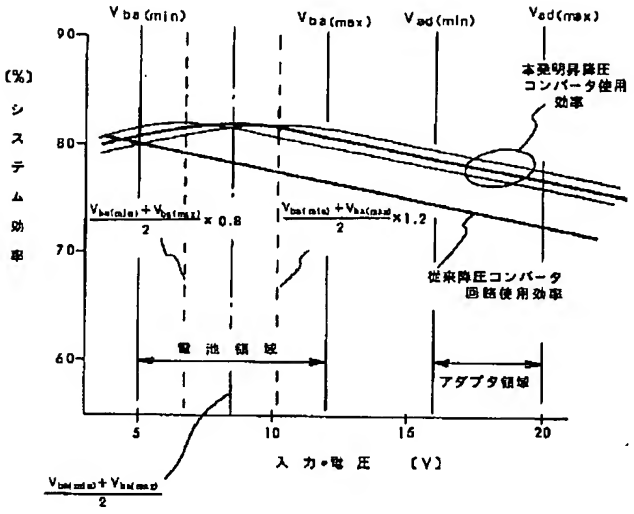
[Drawing 4]

図 4



[Drawing 5]

図 5



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Ｈ０５Ｂ　41/29		Ｃ		
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審査請求　未請求　請求項の数３　ＯＬ　（全　４　頁）

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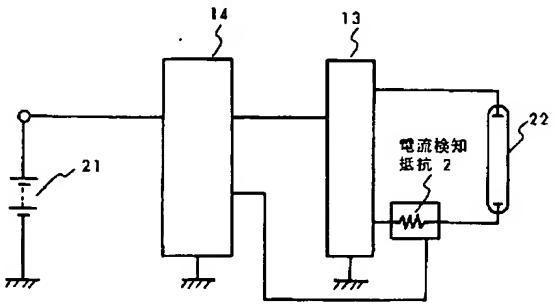
(54)【発明の名称】　蛍光ランプ用点灯回路

(57)【要約】
【目的】電池使用電圧領域における効率改善を図った液晶バックライトシステム等のランプ点灯回路を提供する。
【構成】液晶バックライトインバータ１３に昇圧，降圧機能を有するコンバータ１４を用い、設定制御出力電圧を電池動作入力電圧変動範囲の上下限値のほぼ中央に設定する。

図　4



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【特許請求の範囲】

【請求項１】蛍光ランプを高周波で駆動するインバータと、その入力電圧を制御して調光させるＤＣ－ＤＣコンバータからなる点灯回路において、制御出力電圧を入力電圧変動範囲内に設定することを特徴とする蛍光ランプ用点灯回路。

【請求項２】請求項１において、前記ＤＣ－ＤＣコンバータで、昇圧と降圧の両方を兼ね備えた動作のできる昇降圧機能を備えた蛍光ランプ用点灯回路。

【請求項３】請求項１において、前記ＤＣ－ＤＣコンバータで、制御出力電圧Vo を特に電池使用時の入力電圧上限値Vba(max)と、下限値Vba(min)に対して（Vba(max)＋Vba(min))／２×０.８≦Vo≦(Vba(max)＋Vba(min))／２×１.２ とした蛍光ランプ用点灯回路。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は主に液晶表示装置のバックライト光源となる蛍光ランプの駆動回路に関する。

【０００２】

【従来の技術】従来の蛍光ランプ用点灯回路は、特開平3－11595号公報に記載のように降圧ＤＣ－ＤＣコンバータの出力電圧を入力電圧変動範囲のＭＩＮ値以下に設定、使用するのが通例である。

【０００３】

【発明が解決しようとする課題】従来技術は、入力電圧変動範囲の狭い領域では有効であるがアダプタ使用時入力電圧と、電池使用時の入力電圧が大きく異なり、また電池使用時の変動範囲が広い場合には不利となる。つまり、降圧コンバータでは制御出力電圧Vo は必ずVo＜Vba(min)…電池使用時下限電圧以下となってしまい、如何なる電圧が入力されてもVba(min) 以下に降圧しなければならない。又、逆に昇圧コンバータでは制御出力電圧Vo＜Vinとなると出力電圧を安定化できなくなり出力電圧はVo＝Vinと上昇してしまう。従って、Vo＞Vad(max)…アダプタ使用時上限電圧以上に設定しなければならず、電池使用時の低い電圧を高い電圧に変換するため効率の低下が避けられなかった、このようにシステム効率に対する考慮がなされていなかった。

【０００４】本発明の目的は、ワイドレンジ電圧対応で効率低下を招くことなく、電池使用時に高効率な蛍光ランプ用点灯回路を提供することにある。

【０００５】

【課題を解決するための手段】上記目的を達するために、本発明は通常用いられる降圧ＤＣ－ＤＣコンバータの出力電圧を入力電圧ＭＩＮ値以下に設定する、もしくは昇圧ＤＣ－ＤＣコンバータの出力電圧を入力電圧ＭＡＸ値以上に設定する方法とは全く別に、昇圧と降圧の両方を兼ね備えた動作のできる点灯回路を用い、制御出力電圧Vo を特にアダプタ使用時入力電圧上限値Vad(max)と、電池使用時入力電圧上限値Vba(max)、入力電圧

2

下限値Vba(min)に対して（Vba(max)＋Vba(min))／２×０.８≦Vo≦（Vba(max)＋Vba(min))／２×１.２と設定する。

【０００６】

【作用】昇降圧機能を備えたコンバータは、設定制御出力電圧Vo より高い入力電圧変動範囲に於いて降圧ＤＣ－ＤＣコンバータとして動作し、設定制御出力電圧Voより低い入力電圧変動範囲に於いて昇圧ＤＣ－ＤＣコンバータとして動作を自動的に切り替える。入力電圧と設定出力電圧差が大きくなるほど電力変換効率が低下するため、入出力電圧差を小さく設定することによってシステム効率を向上させることが可能となる。したがって設定制御出力電圧を効率が最も重視される電池入力電圧変動範囲の上下限値のほぼ中央に設定すれば、システム効率を改善することができる。

【０００７】

【実施例】以下、本発明の一実施例を図１ないし図５により説明する。図１は従来のインバータ回路のブロック図を示す。電源２１は通常アダプタ及び電池の二電源で構成され、電源２１の電圧変動を降圧コンバータ１１で吸収して帰還電圧設定抵抗１で設定される電源電圧以下の一定電圧に降圧する。この出力電圧をメインインバータ１３に印加しＤＣ－ＡＣ変換を行いランプ２２を点灯する。

【０００８】この方式では、つまり降圧コンバータでは制御出力電圧Vo は必ずVo＜　Vba(min)… 電池使用時下限電圧以下となってしまい、如何なる電圧が入力されても電池使用時下限電圧Vba(min) 以下に降圧しなければならない。

【０００９】電池使用時下限電圧Vba(min)からアダプタ使用時上限電圧Vad(max)へと入力電圧が上昇するに伴いシステム効率は下降し続ける。この方式における最大効率ポイントは電源電圧の最低電圧（Vba(min)）に存在する。

【００１０】図２は本発明の一実施例を示す。電源２１は通常アダプタ及び電池の二電源で構成され、降圧コンバータ１１と昇圧コンバータ１２のそれぞれの機能を有する二種類のコンバータからなり帰還電圧により（Vba(max)＋Vba(min))／２＜Vo時には昇圧コンバータ１２を動作させ、Vo＜（Vba(max)＋Vba(min))／２時には降圧コンバータ１１を動作させる。この出力電圧をメインインバータ１３に印加しＤＣ－ＡＣ変換を行いランプ２２を点灯する。

【００１１】図３は本発明の一実施例を示す。電源２１は通常アダプタ及び電池の二電源で構成され、昇降圧コンバータ１４からなる。これは降圧コンバータ１１にトランジスタ，ダイオードを新たに追加して構成されるもので(Vba(max)＋Vba(min))／２＜Vo時には昇圧コンバータとして動作し、Vo＜(Vba(max)＋Vba(min))／２時には降圧コンバータとして動作する。

【００１２】切り替え動作制御は帰還電圧設定抵抗１による場合と、図４に示す電流帰還抵抗２によっても可能である。

【００１３】本発明の効率特性効果を図５に示す。図５より、本発明によれば、電池使用領域のほぼ中央点に於いて最大効率を発揮し、（Vba(max)＋Vba(min)）／２×０.８＞Vo領域では、従来回路効率に対する優位性が薄れ、又逆に(Vba(max)＋Vba(min))／２×１.２＜Vo領域では、電池使用時下限電圧Vba(min)時の効率低下が予想されるため(Vba(max)＋Vba(min))／２×０.８≦Vo≦（Vba(max)＋Vba(min)／２×１.２条件下で効率改善が図られる。

【００１４】

【発明の効果】本発明によれば、最も効率が重視される電池使用領域に於いて最適効率が得られ、システムの消

費電力低減に効果がある。

【図面の簡単な説明】

【図１】本発明の一実施例を説明する従来蛍光ランプ用点灯の回路図。

【図２】本発明の一実施例を説明する蛍光ランプ用点灯の回路図。

【図３】本発明の一実施例を説明する蛍光ランプ用点灯の回路図。

【図４】本発明の一実施例を説明する蛍光ランプ用点灯の回路図。

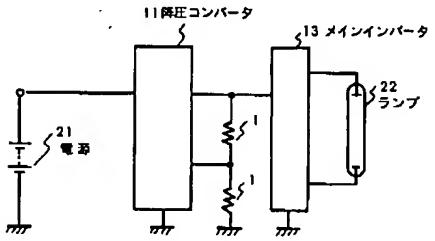
【図５】本発明の一効果例を説明する効率の特性図。

【符号の説明】

１…抵抗、２…電流検知抵抗、１１…降圧コンバータ、１２…昇圧コンバータ、１３…メインインバータ、１４…昇降圧コンバータ、２１…電源、２２…ランプ。

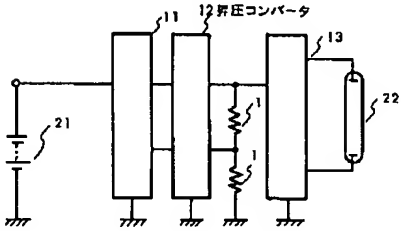
【図１】

図 1



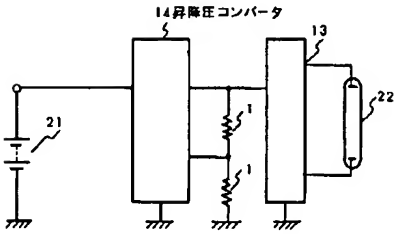
【図２】

図 2



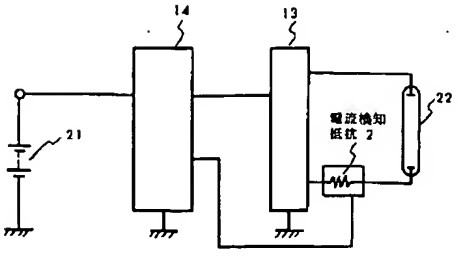
【図３】

図 3



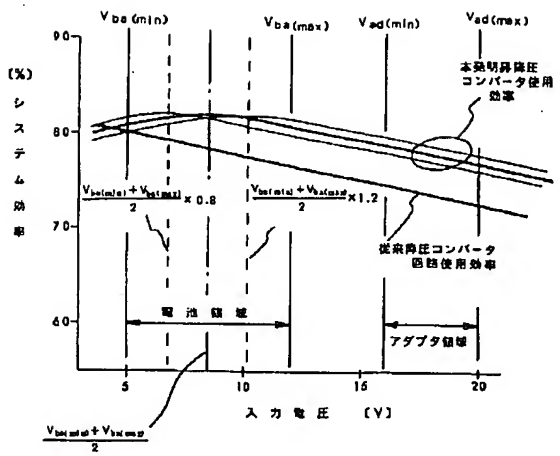
【図４】

図 4



【図5】

図 5


Vba(min)
Vba(max)
Vad(min)
Vad(max)
90
80
70
60
(%)
システム効率
本発明昇降圧コンバータ使用効率
従来降圧コンバータ回路使用効率
電池領域
アダプタ領域
5
10
15
20
入力電圧 (V)